

## CLEAR HARD-COAT FILM

Patent Number: JP8188661  
Publication date: 1996-07-23  
Inventor(s): NAKAI YASUO;; SAKAMOTO TORU  
Applicant(s): DAINIPPON PRINTING CO LTD  
Requested Patent: ☐ JP8188661  
Application Number: JP19950016370 19950109  
Priority Number(s):  
IPC Classification: C08J7/04; B29C35/08; B32B9/00; B32B23/08; B32B27/20; C08L1/12  
EC Classification:  
Equivalents:

### Abstract

**PURPOSE:** To prepare a hard-coat film which is excellent in optical characteristics, surface-protecting properties, slipperiness, performance and processibility.

**CONSTITUTION:** This clear hard-coat film 4 is prepd. by forming a hard-coat layer 2 comprising an ionizing-radiation-curable resin, fine inorg. and/or org. particles 3, and an org. silicone on one side of a triacetylcellulose film 1. The hard-coat layer 2 is formed by applying a compsn. comprising 100 pts.wt. ionizing-radiation-curable resin, 0.3-0.8 pt.wt. fine inorg. and/or org. particles having an average particle size of  $1 \pm 0.5 \mu\text{m}$ , and 0.02-0.2 pt.wt. org. silicone to the film in a coating wt. (after being cured) of 7-30g/m<sup>2</sup>.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention is used for a polarization film with respect to the hard-coat \*\*\*\*\* plastic film by the ionizing-radiation hardening type resin on a front face, and relates to a hard-coat film with the slippage of the surface layer excellent in processing suitability.

[0002]

[Description of the Prior Art] After a former and polarization film forms the polarization film which iodine and a dichromatic dye are made to stick to the film for polarization films which extended and carried out orientation, and has polarizability, what prepared and constituted \*\*\*\*\* to the both sides is common. The film of polyvinyl alcohol or its derivative is used and, as for the film for polarization films, the film of the non-orientation of a cellulose-acetate system resin or an acrylic resin is used as the protective coat. And the protective coat is performed in the form sealed to what was formed in the saccate besides pasting with a film, and the application of a solution-like resin.

[0003] Thus, the obtained polarization film is used for removal of the member for an ornament, and the other reflected lights focusing on the liquid crystal display member, and while polyvinyl alcohol iodine and the polarization film which used the triacetyl-cellulose film (this specification indicates a TAC film hereafter) for the protective coat have the outstanding optical property and the high rate of polarization is shown in the latus wavelength range especially as a polarization film, it is used abundantly from excelling in a luminosity and contrast. Moreover, in order that such a polarization film may raise surface abrasion-proof nature, chemical resistance, etc. further, preparing a hard-coat layer in the TAC film used as a protective coat further is performed.

[0004]

[Problem(s) to be Solved by the Invention] Although the polarization film which prepared the above-mentioned hard-coat layer is satisfying once as a performance of a final product, it has still left various troubles depending on the manufacturing process and the military requirement. For example, in order are good and to produce a quality product more efficiently in the yield, the method of carrying out the laminating of the TAC film which applied and prepared the hard-coat layer to a polarization film is desirable [ the aforementioned hard-coat layer ] in a real production process, also from the point of productivity rather than it applies to what carried out the laminating of the TAC film to the polarization film. However, since both TAC film planes of a hard-coat layer and a rear face become smooth and it sticks when the hard-coat layer which is rich in smooth nature is applied to a TAC film and formed, the film which carried out hard-coat one becomes what has bad slipping nature. For this reason, when the film which applied and formed the hard-coat layer is made into the shape of winding, deformation of the shape of irregularity called a "crater" and "pyramid" with some films is generated, and it has become the cause which a process loss increases.

[0005] In order to generate in order that a film may stick the cause of a crater and a pyramid, and to prevent it, the hard-coat layer which consists of application liquid containing extenders, such as a silica, and an organic macromolecule bead was prepared, and mat-izing an application side was performed. However, when chemical resistance could fall since the material of mat-izing deposited in part on the front face of a hard-coat layer, or a uniform application was not able to be formed since it is hard to equalize distribution in application liquid, or application liquid was hardened by ultraviolet rays, there was a trouble that the hard-coat layer which has the degree of hardness of a desired front face by oxygen prevention was not obtained.

[0006] this invention solves the above troubles, and the hard-coat layer prepared in one field of a TAC film is cratered, and it aims at offering a film with the slippage of the front face which can prevent the adhesion leading to a pyramid.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the slippage film of this invention prepares the slippage section of the concavo-convex pattern which becomes with an ionizing-radiation hardening type resin in one field of a base-material film. And for Ra, the average interval Sm of 0.06-0.7 micrometers and irregularity is [ this concavo-convex pattern / the Hayes value of 1000-3000 micrometers and a resin layer ] less than 1.0% of thing in surface center line average coarseness. Moreover, this concavo-convex pattern is established through an allocated type film.

[0008] this invention is drawing 1 (b). It is the slippage film 14 in which the slippage section 31 which formed the hard-coat layer 4 by the ionizing-radiation hardening type resin in the base-material film 1 as shown, and carried out the allocated type

of the concavo-convex pattern 3 to it on the front face was formed. And this concavo-convex pattern is beforehand prepared in the allocated type film 2.

[0009] The base-material film used for this invention forms the protective layer of a polarization film, and is excellent in all beam-of-light permeability, and Hayes can select it from a low film. For example, there are films, such as the poly methyl pentene, a cellulose triacetate, a cellulose diacetate, a polymethylmethacrylate, polystyrene, a polyvinyl chloride, a polycarbonate, and polyvinyl butyral. Usually, the TAC film's manufactured by the cast method is used preferably, and contains plasticizers, such as phosphoric ester, three to 10% of the weight. And although it is based also on the physical properties of a base-material film, such as rigidity, when using as a protective coat of the polarization film for liquid crystal displays, although not limited especially about thickness, either, it is 75-100 micrometers.

[0010] The compound used for the hard-coat layer of this invention can be used choosing it suitably from conventionally well-known resins for hard-coat layers, such as various kinds of acrylic resins, siloxane system resins, etc. Moreover, there is hardening by ultraviolet rays, the electron ray, and heating etc. also about the hardening method. As for excelling in workability, it is desirable to use the ionizing-radiation hardening type resin which can use ultraviolet rays and an electron ray for hardening. It is the constituent which generally mixed suitably the prepolymer which has a polymerization nature unsaturated bond or an epoxy group in a molecule, oligomer, and/or the monomer. For example, the constituent which consists of silicone, such as acrylate resins, such as urethane acrylate, polyester acrylate, and epoxy acrylate, and a siloxane, is mentioned.

[0011] When reacting and stiffening the constituent of these ionizing-radiation hardening type resins by ultraviolet rays, it can choose from the acetophenones which are a photopolymerization initiator, benzophenones, MIHIRA benzoyl benzoate, alpha-AMIROKI SIMM ester, and tetramethyl MEURAMU monosulfide JIOKISANTON suitably, and n butylamine, a triethylamine, a tree n-butyl phosphine, etc. can be further mixed and used as a photosensitizer if needed.

[0012] The coverage of the hard-coat layer formed using such a resin constituent as application liquid has the desirable range of 3 - 20 g/m<sup>2</sup> (solid content). 3 g/m<sup>2</sup> It generates a minute fault in an application side and is not desirable, when it cannot have abrasion-proof nature sufficient in below but an aggregate is produced in application liquid. Moreover, 20 g/m<sup>2</sup> Above, the need does not exist, the inclination for elevation of Hayes, decline in a light transmission, and a film to generate curling rather is seen, and it is disadvantageous also from a cost side.

[0013] The allocated type film with the concavo-convex pattern which forms the slippage section is a film which prepared the concavo-convex pattern whose average interval  $S_m$  of 0.06-0.7 micrometers and irregularity  $R_a$  is 1000-3000 micrometers in surface center line average coarseness in transparency and the heat-resistant film that what is necessary is just the film which does not have trouble in irradiation of an ionizing ray. For example, it can choose suitably from polyester, a polyamide, ethylene and a vinyl acetate copolymer saponification object, the poly methyl pentene, etc., and the oriented film of a polyethylene terephthalate is excellent in transparency and thermal resistance, and is used preferably. And the thickness is thickness with a 15-38-micrometer thing desirable in view of workability.

[0014] The concavo-convex pattern prepared in an allocated type film is a film which lacks transparency a little which can consider more the microscopic concavo-convex pattern spontaneously formed under the influence of processes, such as cooling, or an impurity, when manufacturing not the mat film that carried out the allocated type of the irregularity with the special mold but a film. And after applying the application liquid by the ionizing-radiation hardening type resin applied to the base-material film, carrying out the laminating of the concavo-convex pattern of an allocated type film in the state of un-hardening, irradiating an ionizing ray and hardening this resin, exfoliation removal of the allocated type film is carried out, and the slippage film which prepared the slippage section in the hard-coat layer is constituted.

[0015]

[Function] Since the touch area of the slippage film which prepared the slippage section by the concavo-convex pattern by the ionizing-radiation hardening type resin in the base-material film with a non-applying field decreases, it acts so that coefficient of friction in the meantime may give 0.5 or less slipping. And the Hayes can be held to less than 1.0%, without reducing the transparency of a base-material film, when the average interval  $S_m$  of 0.6-0.3 micrometers and irregularity prepares  $R_a$  in 1000-3000 micrometers in surface center line average coarseness. Moreover, there is also no hardening prevention by oxygen by forming the slippage section of an ionizing-radiation hardening type resin with an allocated type film, and the slippage film which could form uniformly, carried out the concavo-convex pattern in this way, and formed it can make slipping between the front reverse sides uniform, without falling abrasion-proof nature and transparency. And even if it makes a slippage film into the shape of winding and produces it, deformation of the shape of irregularity of the shape of a crater or a pyramid can be prevented.

[0016]

[Example] Next, this invention is explained still in detail about an example.

[Example 1] to one field of TAC film (FT-UV80 Fuji Photo Film make) winding with a thickness of 80 micrometers it is thin on the base-material film 1 The ultraviolet-rays hardening type resin (40-13S Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make) used as the hard-coat layer 4 on a roll coat Meet and the laminating of the concavo-convex pattern 3 which S-PET25micrometer has is carried out. it becomes 7 g/m<sup>2</sup> (solid content) -- as -- applying -- the non-hardened layer -- as the allocated type film 2 -- the Toray Industries, Inc. make -- After irradiating continuously the black light (the high-pressure-mercury-lamp 2 LGT type of output 160 W/cm, 10cm of distance) at the rate of 10 m/min and stiffening it, exfoliation removal of the allocated type film 2 was carried out, and winding of the slippage film 14 which has the slippage

section 31 in the hard-coat layer 4 was created.

[0017] [Example of comparison 1] The film of the example of comparison which formed the hard-coat layer 4 like the example 1 without carrying out the laminating of the allocated type film to the TAC film 1 was created.

[0018] About rolling up of the example created as mentioned above and the example of comparison, the result evaluated about each following item is shown in Table 1.

(1) All light transmissions : JIS It measures according to K-7105.

(2) Hayes Whenever [ cloudy ]: JIS It measures according to K-7105.

(3) Coefficient of static friction : measure a TAC film and hard-coat coefficient of static friction. In addition, it equipped and the sample was measured so that a hard-coat layer might appear in a thread side at a TAC film and ramp side.

When coefficient-of-static-friction  $\mu_0 = \tan\theta$ , however  $\theta$  make a ramp incline by 2.7 degrees in inclination speed, and sec, they are taken as the angle (a friction angle or angle of repose) on which a thread begins to slide.

Thread weight 1kg.

(4) chemical-resistant : -- 60 degrees C and 8% -- it is immersed for caustic soda solution 90 seconds, and check change of a hard-coat layer visually

(5) Surface hardness : measure the pencil degree of hardness by 1000g load.

(6) Surface roughness : JIS According to B0601, Ra and the concavo-convex average interval Sm are measured in center line average coarseness.

(7) Winding state : judge 1500 m surface state visually.

[0019]

評 価 項 目	実 施 例	比 較 例
全光線透過率 (%) (基準値 90%以上)	90.5	91.3
ヘイズ 曇り度 (%) (基準値 1%以下)	0.9	0.9
静摩擦係数 (基準値 0.8%以下)	0.5	1.8
耐 薬 品 性	変化なし	変化なし
表面硬度	2H	H
表面粗さ Ra $\mu\text{m}$	0.072	—
平均間隔 Sm $\mu\text{m}$	1765	—
巻取りの表面状態 1500m巻	変形なく良好	ピラミッドを 多数発生

[Table 1] Evaluation result

[0020] Although the thing of the example of comparison was good in respect of the optical property, since the coefficient of static friction was large, it generated deformation of a concavo-convex pyramid, a crater, etc. in the state of winding, so that clearly from the evaluation result shown in Table 1. On the other hand, in order that the slippage section prepared in the hard-coat layer might reduce a coefficient of static friction, the thing of an example did not have the deformation in a winding state, either, and was good.

[0021]

[Effect of the Invention] As explained to the detail above, it excels chemical-resistant, all light transmissions have 90% or more, Hayes has 1% or less of optical property, further, the coefficient of static friction between the front reverse sides is slippery by 0.5 or less, and, as for the slippage film of this invention, a degree of hardness and the productivity which does not produce deformation of the shape of a crater and irregularity, such as a pyramid, even if a sex is good and changes into a winding state do so the effect that a good slippage film can be offered.

[Translation done.]



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] While this invention relates to the clear hard-coat film used for the front face of a polarization film as a protective coat and excelling in the optical property and surface-protection nature especially, the slipping nature between the front reverse sides is related with the clear hard-coat film which was well excellent also in post-processing fitness.

[0002]

[Description of the Prior Art] Conventionally, after a polarization film creates the polarization film which iodine and a dichromatic dye are made to stick to the polarization film base-material film which carried out extension orientation, and has polarization ability, its thing of composition of having made the protective coat form in the both sides is common. As a polarization film base-material film, polyvinyl alcohol (it omits Following PVA) and its derivative film are mainly used, and the filmy material of non-orientation is used substantially [ a cellulose-acetate system resin (mainly triacetyl cellulose) or an acrylic resin ] as a protective coat. And formation of a protective coat is performed also in form which is sealed to a bag-like object besides pasting of a film-like object, or the application of a solution-like object.

[0003] Thus, the polarization film which the obtained polarization film is used for the member for an ornament, the other removal uses of the reflected light, etc. focusing on the member for liquid crystal displays, used the PVA-iodine system coat especially for the polarization film, and used the triacetyl-cellulose film (it abbreviates to a TAC film below) for the protective coat is used abundantly from excelling also in a luminosity and contrast while it has the outstanding optical property and shows the high rate of polarization in the latus wavelength range. Moreover, in order that such a polarization film may raise surface abrasion-proof nature, chemical resistance, etc. further, the thing which was done for the laminating as a protective coat film and which prepare a hard-coat layer further on a TAC film is performed, for example.

[0004] The polarization film which prepared the above hard-coat layers has still left various troubles depending on the performance demanded, although what can be satisfied as a performance of a final product is obtained. for example, more efficiently a quality product in an actual production process There are rapidity and mass-production nature, the yield is good, and in order to produce by the low cost, the sequence of a process etc. is suitably set up according to a situation. the point of economical efficiency, such as reduction of a loss, to especially the aforementioned hard-coat layer It does not apply to what carried out the laminating of the TAC film to the polarization film, but it applies and forms in the TAC film previously, and the method of carrying out the laminating of this to a polarization film is desirable.

[0005] However, when it is a type [ that a hard-coat layer is clear and flat ] and a hard-coat layer is applied and formed in a TAC film also by this method, both a hard-coat side and a TAC film plane on the back become smooth, the hard-coat film itself is very slippery, and it becomes a bad sexual thing. For this reason, in the application of a hard-coat layer, and the winding stage at the time of formation, irregularity-like deformation of the so-called "crater", a "pyramid", etc. is generated, and it has become the cause of the increase in a process loss.

[0006]

[Problem(s) to be Solved by the Invention] The method of making a hard-coat layer contain particles, such as a mixed stock of minerals, the quality of organic, or both, sliding, and improving a sex, in order to prevent generating of the irregularity-like deformation at the time of winding resulting from the poor slipping nature of the above clear hard-coat films is performed. However, to improvement in slipping nature, although addition of the particle to such a hard-coat layer is a very effective means, it has the problem on which optical properties, such as the Hayes value, are reduced with the increase in an addition. Therefore, although the addition of a particle is stopped by the minimum for obtaining required slipping nature, although it is small, when there is elevation of the Hayes value and it still uses for the member for liquid crystal displays (LCD) etc. especially, there is a problem which has influence which is not desirable on the optical property.

[0007] Moreover, although a clear hard-coat film uses adhesives for the front face of a polarization film, lamination is carried out at a back process and a polarization film is made to it, in order to raise the bond strength, it is flooded with an alkaline-water solution by considering a clear hard-coat film as pretreatment, and is performing saponification processing of a TAC film plane. However, a hard-coat side is influenced by this saponification processing, and as a result of producing the dissolution of the particle exposed to a front face, or defluxion and a surface state's changing, there is also a problem of raising the Hayes value further.

[0008] Therefore, this invention solves the above troubles and sets them on the clear hard-coat film which prepared the flat

hard-coat layer in one field of a TAC film. While excelling in optical properties, such as the Hayes value and a light transmission, and excelling in surface abrasion-proof nature and every chemical-resistant protection performance Slipping nature between the front reverse sides (i.e., a hard-coat side) and with a TAC film plane does not produce irregularity-like deformation etc. well at the time of winding after a hard-coat layer application, but aims at offering the clear hard-coat film excellent also in post-processing fitness.

[0009]

[Means for Solving the Problem] This invention persons attain the purpose by the following this inventions, as a result of inquiring wholeheartedly paying attention to the composition of a hard-coat layer, in order to solve the above-mentioned technical problem. That is, it consists of a clear hard-coat film characterized by forming invention of this claim 1 in the clear hard-coat film which comes to prepare a hard-coat layer in one field of a TAC film with the constituent with which this hard-coat layer made the ionizing-radiation hardening type resin contain the particle and the organic system silicone of minerals and/or the quality of organic.

[0010] And invention of this claim 2 is a clear hard-coat film with which this hard-coat layer is characterized by containing the 0.3 - 0.8 weight section and organic system silicone for the particle of the minerals whose mean particle diameter is  $1 \times 0.5$  micrometers, and/or the quality of organic at a rate of the 0.02 - 0.2 weight section to the ionizing-radiation hardening type resin 100 weight section in the clear hard-coat film which comes to prepare a hard-coat layer in one field of a TAC film.

[0011] Moreover, invention of this claim 3 is 7 - 30 g/m<sup>2</sup> at the solid content after the coverage of the aforementioned hard-coat layer hardening. It consists of a clear hard-coat film according to claim 1 or 2 characterized by being in the range.

[0012] Although especially limitation is not carried out, usually, there is much what was manufactured by the cast method, and, as for the triacetyl-cellulose film (TAC film) used for this invention, it contains plasticizers, such as phosphoric ester, three to 10% of the weight. Although there is especially no limitation also about thickness, when using as a protective coat of the polarization film for liquid crystal displays (LCD), about 80 micrometers is common.

[0013] The resin used for a hard-coat layer in this invention is an ionizing-radiation hardening type resin, and conventionally well-known resins for hard-coat one, such as various kinds of acrylic resins, siloxane system resins, etc., can be used for it. Moreover, any method of UV (ultraviolet rays) hardening and EB (electron ray) hardening can be used also about the hardening method. Such a resin is the constituent which generally mixed suitably the prepolymer which has a polymerization nature unsaturated bond or an epoxy group in a molecule, oligomer, and/or the monomer, for example, constituents, such as silicone, such as various acrylate resins, such as urethane acrylate, polyester acrylate, and epoxy acrylate, and a siloxane, and polyester, and an epoxy resin, are mentioned.

[0014] Although you may remain as it is when stiffening the constituent of these ionizing-radiation hardening type resins by the electron ray, in making it react and harden by ultraviolet rays As a photopolymerization initiator, acetophenones, benzophenones, MIHIRA benzoyl benzoate, It can select from alpha-AMIROKI SIMM ester, tetramethyl MEURAMU monosulfide, and thioxan tons suitably, and can add, and n butylamine, a triethylamine, or a tree n-butyl phosphine can be further added as a photosensitizer if needed.

[0015] The particle of the minerals which the aforementioned resin is made to contain by this invention, and/or the quality of organic is for appearing on a coat front face on the occasion of formation of a hard-coat layer, decreasing a touch area with a TAC film at the time of rolling up etc., sliding, and giving a sex. Therefore, it is also desirable that a silica, an alumina, etc. spoil transparency comparatively with minerals few. Moreover, qualitatively of organic, particles, such as acrylic resin, styrene resin, a urethane resin, a polycarbonate, and nylon, can be used.

[0016] The mean particle diameter of these particles has the desirable range of  $1 \times 0.5$  micrometers, and the addition can usually be added to 1 weight section grade to the resin 100 weight section. If saponification processing is performed at a back process as it stated previously, although it slid in the application stage of a hard-coat layer when 1 weight section grade addition was carried out, free and, and the sex was also good and the Hayes value was also good at 1% or less, the Hayes value will rise, and it comes to exceed 1%, and becomes unsuitable depending on a use in respect of an optical property. therefore, the part which holds down the addition of a particle to the range of the 0.3 - 0.8 weight section in this invention, is slippery with reduction of the addition of a particle, and runs short of sexes -- in order to compensate this, organic system silicone is added in the range of the 0.02 - 0.2 weight section The outstanding optical property is obtained at the same time it obtains moderate slipping nature by taking such composition.

[0017] As mentioned above, the organic system silicone which the ionizing-radiation hardening type resin of a hard-coat layer is made to contain with the particle of minerals and/or the quality of organic in this invention is silicone oils, and either an oily thing or its reaction hardening type's is usable. moreover, for example, there are silicone oils, such as epoxy denaturation, amino denaturation, carboxyl denaturation, alkyl denaturation, hydronalium KISHIRU denaturation, and polyether denaturation, and independent [ in these ] with various denaturation silicone, -- or it can also be mixed and used And it is useless, without these additions having a desirable 0.02 - 0.2 weight section grade to the resin 100 weight section of a hard-coat layer, sliding on them below in the 0.02 weight sections, and sufficient auxiliary effect over a sex not being acquired, and slipping nature of the 0.2 weight sections [ more than ] improving further, and is [ an inclination for the Hayes value to rise by saponification processing after a hard-coat layer application rather ] and is not desirable.

[0018] The coverage of the hard-coat layer formed using such a resin constituent is 7 - 30 g/m<sup>2</sup>, although the path of the particle to add is related. The range is desirable and it is 7 - 20 g/m<sup>2</sup>. The range is still more desirable. 7 g/m<sup>2</sup> Although the following is also possible for formation of a hard-coat layer, when an aggregate is produced to the added particle, it is not

desirable at the point a minute granular fault becomes easy to generate in a coat side. And 30 g/m<sup>2</sup> The need does not exist, the rise of Hayes and the inclination of decline in a light transmission are seen rather, and the above is disadvantageous also in respect of cost.

[0019]

[Function] The clear hard-coat film of invention of this claim 1 forms this hard-coat layer in the clear hard-coat film which comes to prepare a hard-coat layer in one field of a TAC film with the constituent which made the ionizing-radiation hardening type resin contain the particle and the organic system silicone of minerals and/or the quality of organic. Thus, by constituting, the coat of an ionizing-radiation hardening type resin gives protection performances, such as abrasion-proof nature and chemical resistance, and even if the particle and the organic system silicone of the added minerals and/or the quality of organic improve the slipping nature between the front reverse sides of a clear hard-coat film and make a film the letter of rolling up, do not produce irregularity-like deformation and it is carried out. Moreover, since the addition of the particle of minerals and/or the quality of organic can be lessened by combined use of organic system silicone, the fall of optical properties, such as the Hayes value, can be lessened.

[0020] In the clear hard-coat film of invention of the aforementioned claim 1, invention of this claim 2 constitutes the particle of the minerals whose mean particle diameter is 1\*\*0.5 micrometers to the ionizing-radiation hardening type resin 100 weight section about a hard-coat layer, and/or the quality of organic so that the 0.3 - 0.8 weight section and organic system silicone may be contained at a rate of the 0.02 - 0.2 weight section. Thus, by constituting, even if the protection performance of a clear hard-coat film and slipping nature are obtained more certainly, and the process loss by irregularity-like deformation etc. does not have them, either and they perform saponification processing at a back process, there is no rise of the Hayes value etc. and the outstanding optical property can be maintained.

[0021] Moreover, it sets on the aforementioned claim 1 or the clear hard-coat film of invention of two, and invention of this claim 3 is 7 - 30 g/m<sup>2</sup> at the solid content after hardening the coverage of a hard-coat layer. It considers as the range. Even if an aggregate arises to the particle added in the hard-coat layer by taking such composition, a granular fault is not produced in a paint film, but good slipping nature certainly comes to be shown, the irregularity-like deformation at the time of rolling up is not produced, either, but a clear hard-coat film is stabilized and the protection performance and optical property which were excellent as a clear hard-coat film with good post-processing aptitude are obtained.

[0022]

[Example] Below, a drawing and a concrete example, and the example of comparison explain this invention still in detail. Drawing 1 is the type section view showing the composition of one example of the clear hard-coat film of this invention. In drawing 1, the clear hard-coat film 4 is the composition of having formed the hard-coat layer 2 which made the ionizing-radiation hardening type resin containing the particle 3 and the organic system silicone (not shown) of minerals and/or the quality of organic in one field of the TAC film 1. And since the hard-coat layer 2 is formed so that the particle 3 and the organic system silicone of the minerals to contain and/or the quality of organic may surface on the front face on the occasion of the coat formation, its slipping nature between the front reverse sides of the clear hard-coat film 4 improves.

[0023] (Examples 1-4, examples 1 and 2 of comparison) To one field of TAC film [FTUV80 Fuji Photo Film make] rolling up with a thickness of 80 micrometers The examples 1-4 shown in the following table 1, the example 1 of comparison, and the application liquid for hard-coat layers of composition of two by the roll coater equipped with the direct drying equipment and the black light The coverage after dryness / hardening is 9 g/m<sup>2</sup>. After removal of the solvent according [ apply so that it may become, and ] to hot air drying, It is a black light (the high-pressure-mercury-lamp 2 LGT type of output 160 W/cm, 10cm of distance) Line speed 10 m/min It let it pass, the paint film was stiffened, it rolled round, and the clear hard-coat film of the shape of winding of examples 1-4 and the examples 1 and 2 of comparison was created, respectively.

[0024]

The composition range \*\* ultraviolet-rays hardening type resin of the application liquid for hard-coat layers in an example and the example of comparison (polyester acrylate system resin)

The [Seika beam (photopolymerization initiator \*\*\*\*) Dainichiseika Colour & Chemicals Mfg. make] 100 weight sections \*\* silica powder (1 micrometer of mean particle diameters) 0 - 0.8 weight section \*\* polyether denaturation silicone 0 - 0.2 weight section \*\* dilution solvent (toluene) The 120 weight sections (following margin)

[0025]

[Table 1] Composition of the application liquid for hard-coat layers



	紫外線硬化 型樹脂 (部)	シリカ粉末 (部)	シリコーン (部)	溶剤 トルエン (部)
実施例 1	1 0 0	0. 8	0. 0 2	1 2 0
実施例 2	1 0 0	0. 7	0. 0 5	1 2 0
実施例 3	1 0 0	0. 7	0. 1 0	1 2 0
実施例 4	1 0 0	0. 3	0. 2 0	1 2 0
比較例 1	1 0 0	0	0. 2 0	1 2 0
比較例 2	1 0 0	0. 5	0	1 2 0

(Note) In Table 1, the "section" shows the weight section.

[0026] [Evaluation and result] It evaluated about the following item by having made into the sample the clear hard-coat film of the examples 1-4 created as mentioned above and the examples 1 and 2 of comparison, and the result was shown in Table 2.

(1) The measurement measuring method of Hayes [degree of overcast] (%) of each sample clear hard-coat film (before saponification processing) : JIS It is based on K-7105 and is Product made from an Oriental energy machine. It measures in a direct reading formula hazemeter.

[0027] (2) The measurement measuring method of Hayes [degree of overcast] (%) after saponification processing of a clear hard-coat film : JIS It is based on K-7105 and is Product made from an Oriental energy machine. It measures in a direct reading formula hazemeter. In addition, saponification processing was carried out by the following method. Putting into the tub which can circulate through the 2-N KOH solution heated at 60 degrees C, and making it flow, it saponified by having immersed each sample film for 90 seconds into it, the stream washed after that, and, subsequently it dried for 60 seconds with the 60-degree C direct drying equipment, and considered as saponification processing.

[0028] (3) The measurement measuring method of a coefficient of static friction : Product made from an Oriental energy machine Friction measurement machine AN type is used and the coefficient of static friction between a TAC film plane and a hard-coat side is measured.

In addition, it equipped and each sample film was measured so that a hard-coat side might appear in a thread side at a TAC film plane and ramp side.

Coefficient of static friction  $\mu_0 = \tan\theta$ , however  $\theta$  are inclination speed. 2.7 degrees/sec When a ramp is made to incline, it considers as the angle (a friction angle or angle of repose) on which a thread begins to slide.

Thread weight 1kg [0029] (4) After clear hard-coat one, about each roll of the evaluation sample of the roll state at the time of winding, the existence of irregularity-like deformation of the so-called "crater", a "pyramid", etc. was investigated visually, and the quality was judged.

[(Following margin) 0030]

	ヘイズ〔曇度〕 (%) (基準値 : 1 %以下)		静摩擦係数 (基準値 : 0. 8 以下)	巻取り時のロール状態 (へこみ、ピラミッド などの凹凸状変形の有 無)
	ケン化前	ケン化後		
実施例 1	0. 4	0. 6	0. 6 1	変形なく良好
実施例 2	0. 3	0. 6	0. 4 7	変形なく良好
実施例 3	0. 4	1. 0	0. 3 3	変形なく良好
実施例 4	0. 4	1. 0	0. 7 0	ほぼ良好
比較例 1	0. 2	0. 2	1. 3 0	変形多く不良
比較例 2	0. 3	0. 5	0. 9 1	若干変形有り不良

[Table 2] Evaluation result

[0031] All were good at 1% or less after [ before the Hayes value's saponifying ] saponification, and the clear hard-coat film of examples 1-4 had cleared 0.8 or less [ of a reference value ] also in the coefficient of static friction, its slipping nature was good, and it has [ generating of irregularity-like deformation ] a roll state at the time of winding and was good so that clearly from the result shown in Table 2. On the other hand, although each Hayes value before saponification and after saponification of the clear hard-coat film of the examples 1 and 2 of comparison was low good, the coefficient of static friction was what generates irregularity-like deformation of a "crater", a "pyramid", etc. at the time of rolling up, and lacks in use aptitude exceeding 0.8 of criteria since [ large ] slipping nature is insufficient.

[0032]

[Effect of the Invention] It excels in protection performances, such as abrasion-proof nature and chemical resistance, and even if saponification processing is performed at a back process, elevation of a Hayes value is suppressed to the minimum, and according to [ as having explained above ] this invention, it has a good optical property, and the effect that the clear hard-coat film excellent in the performance and the processing suitability of not producing irregularity-like deformation etc. even if the slipping nature between the front reverse sides is good and makes it the shape of winding further can offer does so.

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[Translation done.]